

Teacher Thinking About Students' Thinking

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Abstract

College teachers are frequently told that knowing the details of the cognitive psychological processes of their students will improve their teaching effectiveness. However, investigations of college teachers' beliefs about teaching and learning have yielded conceptions of teaching at a very general level. Most studies have resulted in conceptions that focus more on the teacher and teaching methods than on the learning processes of students. This paper argues for a more differentiated study of teacher thinking about student thinking that explores what teachers tacitly believe about their students' attention, memory, learning strategies and motivation. Potential implications of differences in how teachers may think about their students' cognitions are explored.

Changing Views of Learning

In our teaching careers, we have all heard or thought the judgments, even if we haven't uttered them. "Joannie just doesn't know anything." "Shanette doesn't know how to study." "Brandon isn't motivated." "Students today don't know anything about history." "Many of the students in my class don't have the ability to succeed in college." "Melvin can't seem to make connections." "This class doesn't remember anything we did two weeks ago." "These guys just don't pay attention." "Anne really sees the big picture." "Roberto knows how to apply what he knows in the real world." "My class was really into the topic today."

Teachers make inferences about their students' thinking. They try to figure out what is going on in students' heads. Teachers are implicit psychologists. Using what their students do in and out of the classroom and their personal psychological theories, teachers make judgments about the thinking processes of their students. My aim in this essay is to explore ways of thinking about the psychological theories held by teachers and how those theories relate to what teachers actually do. I will argue that a more detailed analysis of how teachers think about their students' thinking than is currently available in the research literature could help us offer better advice to teachers who want to increase the positive effects they have on their students' learning.

The Cognitive Revolution

The past 40 years of theory and research in psychology has been characterized by some scholars as the "cognitive revolution" (how revolutionary these changes have been is disputed by historians of psychology, but that need not concern us here). A shift has occurred in the emphasis given to explanations of human behavior that include references to processes of attention, memory, and thinking. One outcome of these changes is that educational and cognitive psychologists have told teachers that they could be more effective in planning and executing their instruction if they took into consideration what psychologists have discovered about how learning occurs.

A wide variety of sources of advice about how to use the principles of cognitive learning are now available to teachers at all levels of education (e.g., Bransford, Brown, & Cocking, 1999; Bruning, 1994; Dominowski, 2002; Lambert & McCombs, 1997). The expert authors of these works tell us that novelty and variety are key elicitors of attention. So, teachers should provide novelty and variety in voice inflection, in moving around the classroom, in using media, and in designing the nature of the activities we do during a particular class. The experts tell us that students can hold only so much information in their consciousness at any one time. Thus, teachers should provide information in small allotments and extend the mental capacity of students by supplying handouts and media representations.

The experts tell us that memory is an active, constructive process in which new information is assimilated into existing memory structures that modify the new information in significant ways. Teachers should be sensitive to what students already know about a topic and take into consideration student interests and goals. The experts tell us students are active learners, using a variety of cognitive strategies all designed to make new material more meaningful. So, teachers should capitalize on the nature of these cognitive strategies by designing activities that encourage their use or even that teach cognitive strategies directly.

Finally, the experts tell us that motivation, rather than being a matter of basic physiological drives, is a matter of thoughtful goals and mental attributions for why we behave the way we do. So, teachers should help students set appropriate learning goals and make attributions that enhance learning.

Student Thinking and Thinking about Student Thinking: A Gap

I do not argue with the wisdom of much of the advice about teaching and learning provided by educational and cognitive psychologists. Knowledge of how people learn has informed my own teaching

and that of many teachers I know. But it occurs to me that we do not know very much about how college and university teachers think about their students' thinking and learning *before* they began to take the advice of cognitivists. There is a subtle contradiction here. Cognitive psychologists tell us that we never come to new learning as a blank slate. Before learning about the implications of cognitive concepts, teachers already had knowledge, however tacit, about student thinking. How they understand, interpret, and remember cognitive concepts will be influenced by previous knowledge. What do we know about college and university teachers' thinking about their students' thinking?

Research on Teachers' Conceptions of Learning and Teaching

There is a fairly substantial literature on elementary and secondary school teachers' ideas about learning and teaching (although most of it suffers from significant conceptual and methodological problems that I do not have space here to elucidate). There is a much smaller body of information about college and university teachers' conceptions of teaching and learning. This research was recently reviewed by Kane, Sandretto, and Heath (2002). The results of the studies they reviewed were of three major types (my interpretation, not theirs).

First, there are studies that organize teachers' conceptions of student learning in terms of teaching methods and related goals. For example, based on interviews with instructors from four disciplines, Dall'Alba (1993) described seven qualitatively different conceptions of teaching. Dall'Alba's list includes teaching as presenting information, transmitting information, illustrating applications of theory to practice, developing concepts and principles, developing the capacity to be expert, exploring ways of understanding, and bringing about conceptual change. Similarly, Johnston's (1996) interviews resulted in four views of teaching, including teaching as manipulating the environment to change student attitudes, encouraging students to interact with academic material, providing a range of explanations, and showing students the big picture. Interviews by Bruce and Gerber (1995) of a small group of faculty members about their conceptions of student learning yielded similar results with faculty members talking about learning as preparing for tests, as applying new knowledge, as acquiring thinking skills, as obtaining professional skills, changing attitudes and as what they called participating in pedagogic experience.

A second type of pattern of results in the studies reviewed by Kane and her colleagues reflect teachers' conceptions as general epistemologies. For example, Kember (1997) originally identified two major conceptions of teaching from interviews and questionnaires, knowledge transmission and learning

facilitation. He then expanded his categories to number five, calling them imparting information and transmitting structured knowledge (both teacher-centered, content-oriented), facilitating understanding and conceptual change (both student-centered, learning-oriented), and student-teacher apprenticeship. Similar distinctions were identified by Trigwell and Prosser (1996) in their interviews of teachers.

The third type of pattern of results represents a mixture of teaching method and epistemology. From a series of interview studies, Samuelowicz and Bain (2001), for example, listed seven ways teachers understood teaching: imparting information, transmitting structured knowledge, providing and facilitating understanding, helping students develop expertise, preventing misunderstandings, negotiating meaning, and encouraging knowledge creation.

In many ways the analyses of teachers' beliefs in higher education closely parallel those reported for elementary and secondary teachers. Most studies conclude with conceptions of teaching that are dichotomous or are dimensional with anchors or endpoints similar to the dichotomous representations. Common contrasts are behaviorist versus cognitive, objectivist versus constructivist, transmission versus invention, memorization versus understanding, or information transmission versus facilitation. It is usually explicitly or implicitly assumed that behaviorism underlies the objectivist, transmission, memorization, and information transmission anchors of the dimensions. However, it is unclear how well-known behaviorist theories (e.g., those of Pavlov, Watson or Skinner) would translate into any of those approaches (none of which includes very explicit references to conditioning or reinforcement concepts). The cognitive assumptions behind the constructivist, invention, understanding and facilitation anchors more easily coincide with implications of theorists such as Piaget, Vygotsky, and those of the information processing ilk, but those are not always made explicit either.

A Model of Thinking about Student Thinking

The existing literature on college and university teachers' beliefs about teaching and learning exhibits several problems. First, as Kane et al. (2002) have pointed out, most of the studies of teacher beliefs have been about what teachers say they do, not how they apply their theories to teaching behaviors. Attempts to investigate connections have shown discrepancies between espoused theories and practice. Second, the studies have really been studies of teacher thinking about teaching methods, not teachers' thinking about student learning or learning processes. Thus, there is a distinct teacher-centered bias in this literature. Third, and related to the previous issue, the conceptions of teaching in the

literature have been very general, even vague. To label a teacher a behaviorist or a constructivist tells little about what a teacher believes about the specific processes of learning. This lack of specificity is likely one factor in the common finding of a lack of correspondence between espoused views and what teachers do (Kane et al.'s "other half of the story"). It also makes it difficult to know how teachers' assumptions might influence how they will receive new ideas about teaching.

It turns out to be hard to introspect about what you think about students' thinking. Most teachers have pieced together a philosophy and practice of teaching rather unsystematically from personal experiences and perhaps a little formal instruction or reading. When we do reflect on our teaching, it is likely to be in terms of the methods we employ, not detailed aspects of our students' thinking and how our methods influence their thinking. However, I am convinced that what teachers believe about components of their students' learning such as attention, memory, learning strategies, and motivation do have important influences on how and what teachers teach. In the rest of this paper, I will speculate on how what teachers think about students' attention, memory, learning strategies, and motivation might influence their teaching in terms of three aspects of teaching: teacher assumptions about what their students bring to the teaching-learning situation, the teaching methods a teacher employs, and how a teacher evaluates learning. I will sketch some selected points of difference in possible views of each of the cognitive components and discuss how different beliefs about each could influence teaching and learning. In the last section of the paper, I will sketch out some possible ways we could learn more about how teachers do think about their students' learning.

Teacher Beliefs about Student Cognitions

The cognitive processing of students involves many different aspects of perception, language, remembering, and problem solving. I have chosen only four aspects of thinking to address here: attention, memory, learning strategies and motivation. However, a comprehensive examination of how teachers think about student thinking will require attention to other areas of cognition. I have included motivation here because recent views of motivation have had a strong cognitive flavor and potentially have important implications for how teachers think about many aspects of their students' cognitions.

Teacher Beliefs about Attention

Attention was once thought by some philosophers and early psychologists to be an act of will. Behaviorists theorized that attention was a product of selective reinforcement of attentive behaviors. Students who pay attention are reinforced by good grades or teacher attention. Students should acquire the habit of attention over time. Once acquired, the habit should tend to generalize to a variety of situations. As long as the environment reinforces attentive behavior, other aspects of the physical situation should not matter very much.

Cognitive psychologists distinguish between two forms of attention. Orienting attention is an automatic response to novelty of one kind or another. The novelty may come in the form of change in place, alterations in sound, or in more complex forms such as incongruity (e.g., the juxtaposition of unusual ideas or perceptual elements of shape, size or color). The second form of attention, selective attention, is more complicated. Selective attention is sometimes conscious. We attend to something because it is relevant to a goal we consider important. However, this more willful form of selective attention is often elusive and may be illusory. I may fully intend to attend to the lecturer, but without any conscious decision making, I find myself attending to the person with the beehive hairdo on my left, to the golf course I played on the previous day, or to the outline of the lecture I am giving the next day. Thus, the distinction between selective, controlled attention and involuntary orienting may often blur.

A teacher who sees attention as a conscious act of will could hold students morally responsible to maintain their attention by exerting their will regardless of what is going on in the classroom or in a reading or writing assignment. Teachers who think about attention in a behavioristic fashion might look for ways to reinforce attention, perhaps by making good grades or teacher praise or attention contingent upon student attention. Teachers who hold beliefs about attention closer to the cognitive view of student attention may work at creating novelty and variety in the classroom and at supporting selective attention to important material. Those teachers may move away from a podium or seat, move around the room, avoid monotones, frequently change activities, and otherwise ensure that change is an important part of their teaching.

Teacher Beliefs About Memory

Memory is a very complex topic (for a highly accessible introduction to the modern understanding of memory, see Schacter, 2001; a more technical but interesting summary of current views can be found

in Koriat, Goldsmith & Pansky, 2000) and I will only illustrate a few possible aspects of memory about which teachers might hold different views. Although everyone would agree that memory involves some kind of storage, there are many possible ways to think about how memories are stored. A common view of memory is that it works like a file cabinet or a tape recorder. Information is simply stored in more or less verbatim form after it has been attended to. Variations on this view might be that the tape recorder is susceptible to background noise and does not pick up all the information, or that the tape is unstable and may lose information over time.

An alternative view of memory storage might be that it is not like a tape recorder at all, but is a reconstructive process. Memory is selective and open to biases created by what a student already knows and by a student's own attitudes and beliefs. Individual memories are constructed products based on new material to be learned, what the student already knows about a topic (accurately or not), and the meanings the students attribute to the new material in what cognitive psychologists call "working memory." When working memory is engaged at a high level, new material is deeply processed (see the section on learning strategies, below).

Teachers who hold a tape-recorder version of memory might stress memorization of significant amounts of information that they presume will remain in storage for long periods of time. Teaching involves the conveying of information from the teacher to the student's memory. Evaluations would involve straightforward recall, or recognition of material in memory. A teacher who takes a reconstructive view of memory might be very sensitive to what students already know and believe and to what misconceptions a student might hold about material to be learned. Classroom activities and out-of-class assignments would attempt to engage working memory, trying to get students to make new material meaningful and therefore memorable. Evaluations likely would be designed to test understanding, not memorization.

A related aspect of memory that could be a source of variability in teachers is beliefs about the degree of detail in which memories are stored. Some teachers may expect that good teaching will lead to verbatim memories. Other teachers may believe that only the gist is stored with most memories and to expect detailed verbatim memories would be unreasonable. Teachers differing on the detail versus gist dimension are likely to make different judgments about what students bring to the learning situation, are likely to design different kinds of classroom activities and out-of-class assignments, and are likely to expect different kinds of performance on exams.

Teacher Beliefs about Learning Strategies

Teacher beliefs about the nature of effective learning strategies probably are correlated with their views of memory storage, but they may not be. Some teachers may believe that the strength of a particular memory trace is connected to the number of times it has been repeated (and thus stamped-in). As long as students listen and/or take notes, learning should occur. Other teachers may believe that a more in-depth form of learning strategies is required for learning to occur. Students must be actively engaged when learning new material (likely correlated with a reconstructive view of memory). They may believe that students need to actively organize material, elaborate on it by connecting it to what they already know, and apply it to new situations before they really have learned it. Learning may be equated with understanding.

Beliefs about learning strategies are likely to have a particular influence on the nature of class activities and out-of-class assignments. If the main source of memory is thought to be repetition, reading and re-reading and re-emphasis in lectures and recitations should enhance learning. Activities that lead away from the central material to be learned, including demonstrations, videos, or debates, may be seen as inefficient or distracting. Exams should be straightforward, likely to be objective in form, and should measure directly what was intended to be learned. If active involvement with material from a variety of different perspectives is believed to be effective, cooperative learning activities, case study analysis, and simulations are more likely to be the teaching activities of choice. Exams should engage thinking and understanding and probably should go beyond the material that has been learned directly.

Teacher Beliefs About Motivation

Motivation, too, is complex and I will focus on only two potential contrasts in the thinking of teachers about student motivation. The first contrast concerns whether teachers emphasize extrinsic motivators such as rewards and punishment, or intrinsic forms of motivation such as curiosity and the need to be competent. A teacher who believes in extrinsic forms of motivation may stress reinforcement (high grades, points and praise) and punishments (low grades, demerits, and humiliation) and expect students to respond to external controls in their classroom activities and evaluations. The teacher who believes in intrinsic forms of motivation may stress attempts to elicit curiosity and interest in classroom activities and homework assignments and self-evaluations.

Another possible source of variance concerns teacher beliefs about motivational goals. Carol Dweck (Dweck & Elliott, 1983; Molden & Dweck, 2000) argues that individuals tend to hold different kinds of achievement goals. Some people hold "performance" goals. Those who are motivated by performance goals desire to maximize success while avoiding failure, want to look successful to others, and want to do so with a minimum of effort. Others hold "learning" goals. Those motivated by learning goals seek to acquire more and better knowledge and skills, see failure as an opportunity to get feedback and make efforts to learn more.

According to Dweck, performance and learning goals are generated by different personal theories of intelligence. Performance goals come from entity or trait theories of intelligence. The entity view of intelligence is that you are born with a certain amount of intelligence and you are not going to get any more. If you are not successful at a task, it is because you simply are not smart enough to do it. Effort is fruitless and is going to make you look unintelligent. Requests for assistance from teachers or peers carry a negative stigma. Learning goals come from incremental theories of intelligence. At any point in time you have a degree of intelligence, but you can get smarter by learning new ways to do things. If you do not succeed at a task, you need to try harder or try a different approach. Effort will make smarter. Getting help from teachers and students can help you get smarter.

Teachers who believe in performance goals and entity theories of intelligence may be more concerned with assessing and rewarding student talent whereas teachers who believe in learning goals and incremental theories of intelligence may be more concerned with developing student talent. Performance/entity teachers may minimize both challenge (except in assessing intelligence) and failure in their classroom activities and assignments. An emphasis on independent performance and competition may be seen as a natural part of the teacher's efforts to decide which students have the most ability. In contrast, learning/incremental teachers may build into their activities and assignments explicit challenges that could lead to failure and set up grading systems that allow for failure to occur. Cooperation, teacher guidance, and frequent use of student feedback may be characteristic of their course design.

Summary: Teachers' Beliefs About Their Students' Thinking

The argument I am making is that a more differentiated view of college and university teachers' thinking about their students' thinking is needed. The general characterization of beliefs about teaching and learning in terms of teaching methods, or as behaviorist versus cognitivist, or objectivist versus

constructivist needs to be unpacked for several reasons. First, such characterizations are simply too vague. The distinctions made are too abstract to be useful in getting teachers to talk about or reflect upon for their own purposes. Second, because the characterizations are so abstract, knowing whether someone has, for example, cognitivist versus behaviorist tendencies does not provide a platform for generating improvements in teaching. In fact, being aware of such labels might even polarize teachers' positions so that they become defensive about a particular perspective that they own. Finally, and perhaps most important, from theoretical and practical perspectives, it is unlikely that teachers' beliefs are ever purely cognitive or behavioral or transmissive or facilitative. Teachers' views of their students' thinking are more like mosaics of different beliefs about the various components of cognition. A teacher may well be a behaviorist in views of motivation and a cognitivist in views of memory or a cognitivist in views of evaluation and a behaviorist about classroom activities. Only when we have a more differentiated conception of teachers' thinking about learning and teaching will we be able to find consistent links between theory and practice.

Where Do We Go From Here?

How can we learn more about teachers' beliefs about their students' thinking and learning? A logical first choice might be to ask them. Interviews with teachers in which the questions are carefully designed to elicit teachers' thinking about student attention, memory, strategies and motivation might give us data to judge speculations like those I provided above. However, we may be asking them to say more than they can know and our questions are most likely to produce teaching method - related responses like those picked up in previous research (Samuelowicz & Bain, 2001, suggest that a potential pitfall of the phenomenographic approach that most of the research has taken may preordain the very kinds of categories that have been reported.).

It is hard talk about *why* you teach things the way you do. Interviews probably need to be combined with the examination of a teacher's syllabi, exams, assignments and classroom activities (see Kagan, 1990, for information about methods of research used in the study of teacher cognitions at the elementary and secondary school levels). It may be possible to create scenarios that capture contrasts between different views of students' cognitive processes and motivation. Using all of these methods, comparisons of teachers who have reputations for being particularly effective to those who are reputed to be less so could be made. More experienced teachers could be compared to the less experienced.

Teachers from different disciplines could be compared. My hope would be that research into teachers' thinking would provide us with a better understanding of the relation between espoused theories of teaching and actual practices and give us all better ways to improve on our teaching and student learning.

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